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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/594,629	09/28/2006	Tomoyuki Takei	AI-432NP	4914

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EXAMINER	
VELASQUEZ, VANESSA T	

ART UNIT	PAPER NUMBER
1793	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/594,629	TAKEI ET AL.	
	Examiner	Art Unit	
	Vanessa Velasquez	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 August 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 5-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 5-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *May 22, 2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of Claims

Claims 2-4 have been canceled. Claims 10 and 11 are newly added. Currently, claims 1 and 5-11 are pending and presented for examination.

Status of Previous Objections

The previous objection of claim 4 is moot in view of Applicant's cancellation of the claim.

Information Disclosure Statement

One (1) information disclosure statement (IDS) was submitted on May 22, 2008. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 112, First Paragraph

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 10 and 11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to

one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Specifically, the claims recite D/R and d/r ratios in the range of 0.05 to 0.24. However, there is no support for the upper bound of 0.24 in the specification or in the originally filed claims. In addition, there is no teaching, suggestion, or evidence as to why 0.24 would be a critical bound for the ratios.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 6,319,337) in view of Hassell et al. ("Induction Heat Treating of Steel," Vol. 4, ASM Handbooks Online). The claims stand rejected on the same grounds set forth in the Office action dated May 14, 2008.

Regarding the amended portions of claim 1, manganese may be present in an amount between 0.4 wt.% and 1.0 wt.% (Yoshida et al., col. 2, ln. 40-45), which overlaps the claimed range.

Still regarding amended claim 1, there is no mention of chromium, copper, or nickel in the composition of Yoshida et al.; thus, they will be regarded as being absent from the disclosed composition. Because the claimed ranges encompass zero percent and the composition of Yoshida et al. does not contain the claimed elements, a *prima*

facie case of obviousness can be made because the claimed ranges and the ranges taught by the prior art overlap.

Still regarding amended claim 1, Yoshida et al. teach that the steel composition may further comprise the following elements, in percent by weight:

Phosphorous	0 – 0.02	(Yoshida et al., col. 2, ln. 14-15)
Sulfur	0 – 0.025	(Yoshida et al., col. 2, ln. 14-15)
Titanium	0.02 – 0.05	(Yoshida et al., col. 3, ln. 4)
Nitrogen	0 – 0.008	(Yoshida et al., col. 3, ln. 4-5)

Yoshida et al. in view of Hassell et al. fails to teach the claimed equations. However, such equations would not result in a patentable difference because it has been held that there is no invention involved in the discovery of a general formula if it covers a composition described in the prior art. In addition, the table below compares the steel composition of Yoshida et al. with that of the instant claim.

	Claim 1	Yoshida et al.	Sample Value in Overlapping Region
Carbon	0.45 - 0.55	0.39 - 0.49	0.48
Silicon	0.10 - 0.50	0.4 - 1.5	0.4
Manganese	0.5 - 1.2	0.4 - 1.0	1
Chromium	0 - 0.5	0	0
Molybdenum	0.15 - 0.25	0 - 0.4	0.2
Copper	0 - 0.5	0	0
Nickel	0 - 0.5	0	0
Ceq value	0.80 - 0.95		0.812
f value	0 - 1.0		0.664

The column on the far right is a value taken from the regions where the claimed ranges and ranges of the prior art overlap. It is clear that the steel of Yoshida et al. satisfies the claimed equations.

4. Claims 1 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 6,319,337) in view of Hassell et al. ("Induction Heat Treating of Steel," Vol. 4, ASM Handbooks Online), and further in view of Watari et al. (US 6,475,305). The claims stand rejected on the same grounds set forth in the Office action dated May 14, 2008.

Regarding the amended portion of claim 1, Yoshida et al. in view of Hassell et al. fail to teach a medium carbon steel containing chromium, copper, and/or nickel. However, Watari et al. teach a steel composition similar to that of Yoshida et al., wherein the steel may further comprise chromium in amount up to 2.0 mass% to improve hardness (Watari et al., col. 8, ln. 1.15); copper, in an amount up to 1.5 mass% to enhance hardness (Watari et al., col. 7, ln. 41-55); and nickel, in an amount up to 2.0 mass% to improve hardness and toughness (Watari et al., col. 7, ln. 56-67). Therefore, it would have been obvious to one of ordinary skill in the art to add one or more of the aforementioned elements to the composition of Yoshida et al. in view of Hassell et al. in order to improve the hardness and toughness of the steel alloy, as taught by Watari et al.

Still regarding amended claim 1, manganese may be present in an amount between 0.4 wt.% and 1.0 wt.% (Yoshida et al., col. 2, ln. 40-45), which overlaps the claimed range.

Still regarding amended claim 1, Yoshida et al. teach that the steel composition may further comprise the following elements, in percent by weight:

Phosphorous	0 – 0.02	(Yoshida et al., col. 2, ln. 14-15)
Sulfur	0 – 0.025	(Yoshida et al., col. 2, ln. 14-15)
Titanium	0.02 – 0.05	(Yoshida et al., col. 3, ln. 4)
Nitrogen	0 – 0.008	(Yoshida et al., col. 3, ln. 4-5)

Yoshida et al. in view of Hassell et al. fails to teach the claimed equations. However, such equations would not result in a patentable difference because it has been held that there is no invention involved in the discovery of a general formula if it covers a composition described in the prior art. In addition, the table below compares the steel composition of Yoshida et al. in view of Watari et al. with that of the instant claim.

	Claim 1	Yoshida et al. in view of Watari et al.	Sample Value in Overlapping Region
Carbon	0.45 - 0.55	0.39 - 0.49	0.48
Silicon	0.10 - 0.50	0.4 - 1.5	0.4
Manganese	0.5 - 1.2	0.4 - 1.0	1
Chromium	0 - 0.5	0 - 2.0 (Watari et al.)	0.1
Molybdenum	0.15 - 0.25	0 - 0.4	0.2
Copper	0 - 0.5	0 - 1.5 (Watari et al.)	0.1
Nickel	0 - 0.5	0 - 2 (Watari et al.)	0.1
Ceq value	0.80 - 0.95		0.832
f value	0 - 1.0		0.454

The column on the far right is a value taken from the regions where the claimed ranges and ranges of the prior art overlap. It is clear that the steel of Yoshida et al. in view of Watari et al. satisfies the claimed equations.

5. Claims 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 6,319,337) in view of Hassell et al. ("Induction Heat Treating of Steel," Vol. 4, ASM Handbooks Online), alone, or further in view of Watari et al. (US

6,475,305), as applied to claim 1 above, and further in view of Iguchi et al. (US 6,270,596). The claims stand rejected on the same grounds set forth in the Office action dated May 14, 2008.

6. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 6,319,337) in view of Hassell et al. ("Induction Heat Treating of Steel," Vol. 4, ASM Handbooks Online), alone, or further in view of Watari et al. (US 6,475,305).

Regarding claim 10, Yoshida et al. in view of Hassell et al., alone, or further in view of Watari et al. do not explicitly teach the claimed D/R ratio and corresponding hardness at an effective case depth D. However, the claimed parameters may be optimized by one of ordinary skill in the art, as evidenced by Hassell et al. With regard to the D/R ratio, the radius R of the tooth may be arbitrarily chosen depending on the desired size of the gear for a particular application. With regard to the effective case depth D, Hassell et al. teach that case depth may be varied by modifying the frequency and the power of the apparatus used in the induction heating process (page 2, second full paragraph, "Surface Hardening by Induction" subsection). Furthermore, the depth of the case will depend on the stresses that the component will endure. For instance, shallow case depths are sufficient in components that bear light and moderate loads (Hassell et al., page 2, second full paragraph, "Surface Hardening by Induction" subsection), while deep case depths are needed in components that must endure heavier loads (Hassell et al., page 2, third full paragraph, "Surface Hardening by

Induction" subsection). Therefore, it would have been obvious to one of ordinary skill in the art to optimize the frequency and power of the induction hardening apparatus in order to achieve a desired case depth for a given load-bearing application.

Still regarding claim 10, with regard to the hardness at a given case depth D, Hassell et al. teach that hardness ultimately depends on the carbon content of the steel (Hassell et al., "Control of Surface Hardness," p. 28). However, surface hardness can also be selectively modified by applying appropriate induction conditions (Hassell et al., "Selective Hardening," p. 3; "Gears," p. 17). These conditions include the workpiece material itself, the heating temperature, the required properties of the resulting heat-treated workpiece, and the type of equipment used in the hardening operation (page 1). Rapid cooling and quenching also create a hard case (Hassell et al., page 1). Furthermore, Hassell et al. teach that hardness patterns may be obtained from calculating the in-service stresses the workpiece is projected to endure (page 3, first paragraph). Therefore, it would have been obvious to one of ordinary skill in the art to (1) determine the required hardness of the finished workpiece, and (2) optimize variables such as cooling rate and heating rate in order to achieve a desired hardness at a given depth within a particular material.

Regarding claim 11, Yoshida et al. in view of Hassell et al., alone, or further in view of Watari et al. do not explicitly teach the claimed d/r ratio and corresponding hardness at an effective case depth d. However, the claimed parameters may be optimized by one of ordinary skill in the art, as evidenced by Hassell et al. With regard to the d/r ratio, the radius r of the shaft may be arbitrarily chosen depending on the

desired size of the shaft for a particular application. With regard to the effective case depth d, Hassell et al. teach that case depth may be varied by modifying the frequency and the power of the apparatus used in the induction heating process (page 2, second full paragraph, "Surface Hardening by Induction" subsection). Furthermore, the depth of the case will depend on the stresses that the component will endure. For instance, shallow case depths are sufficient in components that bear light and moderate loads (Hassell et al., page 2, second full paragraph, "Surface Hardening by Induction" subsection), while deep case depths are needed in components that must endure heavier loads (Hassell et al., page 2, third full paragraph, "Surface Hardening by Induction" subsection). Therefore, it would have been obvious to one of ordinary skill in the art to optimize the frequency and power of the induction hardening apparatus in order to achieve a desired case depth for a given load-bearing application.

Still regarding claim 11, with regard to the hardness at a given case depth d, Hassell et al. teach that hardness ultimately depends on the carbon content of the steel (Hassell et al., "Control of Surface Hardness," p. 28). However, surface hardness can also be selectively modified by applying appropriate induction conditions (Hassell et al., "Selective Hardening," p. 3; "Gears," p. 17). These conditions include the workpiece material itself, the heating temperature, the required properties of the resulting heat-treated workpiece, and the type of equipment used in the hardening operation (page 1). Rapid cooling and quenching also create a hard case (Hassell et al., page 1). Furthermore, Hassell et al. teach that hardness patterns may be obtained from calculating the in-service stresses the workpiece is projected to endure (page 3, first

paragraph). Therefore, it would have been obvious to one of ordinary skill in the art to (1) determine the required hardness of the finished workpiece, and (2) optimize variables such as cooling rate and heating rate in order to achieve a desired hardness at a given depth within a particular material.

Response to Arguments

Applicant's arguments filed August 8, 2008 have been fully considered but they are not persuasive.

First, Applicant argues that Hassell et al. do not disclose or suggest any range of surface hardness of the gear teeth and roots. The Examiner takes the position that the prior art of record still renders the claimed invention *prima facie* obvious because the references disclosed, particularly Hassell et al., teach a well-known method (i.e., surface induction hardening), the conditions under which this method is carried out (e.g., cooling rate, heating rate), and strategies to calculate pre-determined parameters (e.g., hardness requirements) (pages 1 and 3) that, when applied to the steel of Yoshida et al., would readily yield predictable results (e.g., deep case or shallow case, hard or soft case, etc.). The surface hardening technique, its parameters, and varying its parameters in a predictable manner to achieve desired properties such as hardness and case depth are recognized as being within the capabilities of one of ordinary skill, as evidenced by Hassell et al.

Second, Applicant argues that the instant invention demonstrates new and unexpected results relative to the prior art. Applicant is reminded mere argument or

repetition of data and statements in the specification without objective comparison evidence to the closest prior art is not sufficient to establish new and unexpected results (MPEP 716.02(b)).

Third, Applicant argues that the claimed equations specify a relationship among the claimed elements. Please see the rejection of claim 1 (above) wherein it is shown that the steel composition of Yoshida et al. alone or in view of Watari et al. satisfy the claimed equations, thereby meeting that claim limitation and establishing a *prima facie* case of obviousness.

Fourth, Applicant argues that the claimed D/R ratio provides new results that are not expected by the lower limit of Iguchi. In response to Applicant's argument, the overlap between the numerical ranges of the claimed properties and those of the prior art is sufficient to establish a *prima facie* case of obviousness. In addition, the fact that a new property of an old product was discovered does not render the instant invention patentable (MPEP § 2112).

Conclusion

Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vanessa Velasquez whose telephone number is 571-270-3587. The examiner can normally be reached on Monday-Friday 9:00 AM-6:00 PM ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached at 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Roy King/
Supervisory Patent Examiner, Art Unit 1793

/Vanessa Velasquez/
Examiner, Art Unit 1793